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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/851,313 | 05/09/2001 | Tatsuya Usami | NEC01P069-MSb | 2820 |

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EXAMINER

MALDONADO, JULIO J

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2823

DATE MAILED: 11/06/2002

11

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/851,313

Applicant(s)

USAMI, TATSUYA

Examiner

Julio J. Maldonado

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 August 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 31-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 31-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. The non-final rejection as set forth in paper No.7 is withdrawn in response to applicants' amendments.
2. A new rejection is made as set forth in this Office Action.
3. Applicant's cancellation to claims 9-30 is acknowledged. Claims 31-42 are newly added. Thus, claims 1-8 and 31-42 are pending in this application.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 35 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In reference to claim 35, applicants' cite "...wherein the second insulation layer comprises a first layer and a second layer...", is not disclosed in the specification. Appropriate correction is required.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 36 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In reference to claim 36, applicants' cite, "...the

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semiconductor device according to claim 36...", renders the claim indefinite since the claim depends on itself. Appropriate correction is required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

9. Claims 1, 3-5, 7, 8, 34, 35, 37, 41 and 42 is rejected under 35 U.S.C. 102(e) as being anticipated by Jeng (U.S. 6,054,769).

Jeng (Figs.1-3e) teaches an interconnect structure (14) comprising a first insulation layer (18) comprising an organic material having a dielectric constant which is lower than a silicon oxide dielectric constant; a second insulation layer (20) comprising hydrogen silsesquioxane and formed on and adhering to a top of said first insulation layer; a third insulation layer (22) comprising an silicon oxide formed on and adhering to a top of said second insulation layer, wherein said first insulation layer (18) has a thickness greater than a thickness of said second insulation layer (20), and wherein said first insulation layer (18) has a thickness greater than a thickness of said third insulation layer (22) and the first (18), second (20) and third (22) insulating layers comprises a multi-layer insulating film; a plurality of wires (14) formed in said multi-layer

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insulation film; and an electroconductive film (16) formed on a recess (column 3, line 49 – column 6, line 55).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 2, 6, 31-33 and 38 rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng ('769) in view of the applicants' admitted prior art in the instant application.

Jeng substantially teaches all aspects of the invention but fails to teach that the first insulation layer comprises an alkyl silsesquioxane having a dielectric constant of no greater than 3.5; and that the wiring layer comprises copper. However, the prior art (Figs.6a-c) teaches a first insulation layer (2) comprising an alkyl silsesquioxane having a dielectric constant of no greater than 3.5; and a wiring layer (6) comprising copper (page 1, line 12 – page 6, line 13). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use an alkyl silsesquioxane as taught by the prior art in the interconnect structure of Jeng, since this would decrease inter-wire capacity (page 1, line 12-15). It would also have been obvious to one of ordinary skill in the art at the time of the invention was made to use copper as an interconnect wire as taught by the prior art in the interconnect structure of

Jeng, since copper is a well-known material for the formation of interconnect structure, and its selection involves ordinary skill in the art.

12. Claims 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng ('769) in view of Allada et al. (U.S. 6,218,317 B1).

Jeng teaches a second insulation comprising hydrogen silsesquioxane, but fails to teach using a methylated hydrogen silsesquioxane film (MHSQ) at a thickness of about 50nm. However, Allada et al. (Figs.1a-1b) in a related art to the formation of an interconnect structure teach a second insulating film comprising a methylated hydrido organo siloxane polymer (column 2, lines 7 – 58). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use the insulating layer as taught by Allada et al. in the interconnect formation structure of Jeng, since this dielectric layers exhibit low dielectric constants (column 2, lines 36-48).

Still, the combined structure of Jeng and Allada fail to teach the dielectric layer having a thickness of about 50nm. However, the selection of the claimed thickness is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious).

Response to Arguments

13. Applicant's arguments with respect to claims 1-8 and 31-42 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-

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mail via julio.maldonado@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.

Julio J. Maldonado

Patent Examiner

Art Unit 2823

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Olik Chaudhuri
Supervisory Patent Examiner
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